

New localities of the Kurdistan newt *Neurergus microspilotus* and Lake Urmia newt *Neurergus crocatus* (Caudata: Salamandridae) in Iraq

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Abstract.—Little is known about the distribution and current conservation status of the two species of mountain dwelling newts of the genus *Neurergus* found in the Zagros Mountain in northern and northeastern Iraq: the Critically Endangered Kurdistan newt *Neurergus microspilotus* (Nesterov 1916), and the vulnerable Lake Urmia newt *Neurergus crocatus* (Cope 1862). Surveys in the Kurdistan region of northeastern Iraq from 2007 to 2012 resulted in the discovery of *N. microspilotus* at seven new localities distributed in the Zagros Mountain of Sulaymaniyah Province. The new locations provide a major range extension of *N. microspilotus*. In addition, four new localities of *N. crocatus* were located between 2007 and 2013. In addition to *Neurergus* newt surveys, interviews with local people were also conducted through the use of photographs. Severe drought during recent years as well as anthropogenic habitat destruction and pollution have been considered as main threats to the survival of both species in northern Iraq. Here we describe new geographical distributions and the conservation status of both *Neurergus* species found in Iraq.

Key words. Kurdistan newt, Lake Urmia newt, *Neurergus microspilotus*, *Neurergus crocatus*, salamanders, Kurdistan region, Iraq

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Introduction

The Kurdistan newts we surveyed corresponded to their description by Nesterov (1916) under the names *Rhithrotriton derjugini* and *R. d. var. microspilotus*. These taxa, *Neurergus d. derjugini* (Nesterov 1916) and *N. d. microspilotus* (Nesterov 1916), are currently considered a single species (Syn. *Neurergus microspilotus* [Nesterov 1916]) and were first recorded in Iraq by Schneider and Schneider (2011), in the close vicinity of their type localities in Iran. The surveys made by Schneider and Schneider (2011) in the Kurdistan region of northern Iraq in spring 2010 reported the Critically Endangered (IUCN Red List 2013) *N. microspilotus* from seven localities situated in the northeastern mountains along the Iraq-Iran border. Leviton et al. (1992) described the range of the Vulnerable (IUCN Red List 2013) Lake Urmia newt (*N. crocatus*; Cope 1862) from northeastern Iraq, eastern Turkey, northwestern Iran, and the Zagros Mountains of Luristan.

Neurergus crocatus was found in Iraq by Allouse (1955) and Khalaf (1959), with a subsequent review of the range and distribution of *N. crocatus* in Iraq by Nader (1969). Al-Adhami and Hameed (1988) carried out a comprehensive study on the histology of the *N. c. cro-*

catus (Schmidt 1939) combined with description of the sampling locations. Mahdi and George (1969) listed both *N. microspilotus* and *N. crocatus* in the herpetofauna of Iraq without providing their range or distribution. Both species were shown to have a restricted range in Iraq and to be allopatric (Najafimajid and Kaya 2010). From 2007 to 2013 we conducted intensive field work to determine the range, distribution, and conservation status of *Neurergus* newts in the Kurdistan region of northern Iraq. Here we describe a new geographical distribution for both species in Iraq and assesses their conservation status.

Material and Methods

We surveyed suitable habitats from 2006 to 2012 for *Neurergus* in the three Iraqi provinces of Kurdistan region in Northern Iraq (Sulaymaniyah, Erbil, and Duhok provinces; Table 1); additional field observations were made during a short survey in 2013. In mountainous landscapes (elevation of ca. 1200–1600 m) consisting of fresh water springs, streams, ponds, and waterfalls, we conducted surveys in order to locate *Neurergus* eggs, larvae, and

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Fig. 1. Google Earth map of northern Iraq (Kurdistan region) shows new localities we discovered during our surveys from 2007 to 2013 for *Neurergus microspilotus* and *N. crocatus*, and those described by Schneider and Schneider (2011).

adults. Adults and larvae were photographed and some collected for morphological examination; especially *N. crocatus*, with focus on the differences between the coloration pattern of the *N. derjugini* / *microspilotus* taxon and those of *N. crocatus*. A Canon EOS Canon EOS 40D camera body equipped with Canon EF 75-300 mm (f 4-5.6) and Canon EF 100-400 mm (f 4) lens was used to take close-up photos to confirm field identifications. We used a Garmin eTrex Waterproof Hiking GPS device to record locations (longitude, latitude, and elevation). Local people were interviewed and shown photographs in order to further identify locations where *Neurergus* spp. have been observed. An IUCN threat assessment score was then calculated to identify the main threats to both *Neurergus* spp.

Results

Kurdistan newt (*Neurergus microspilotus*)

Neurergus microspilotus is mainly found at an elevation of about 1200–1600 m in the fresh water springs, streams, ponds, and waterfalls of the Zagros Mountain

Forest Steppe Ecoregion in northeastern Iraq. These water bodies are primarily found on hillsides or in deep wooded valleys. The 2012 surveys located populations of *N. microspilotus* (18 individuals: 12 males; 6 females; 442 larvae) at seven new locations along the Iraq-Iran northern border (Table 1, Fig. 1). The previously recognized populations of *N. microspilotus* in Iraq are mainly restricted to the mountains of northeastern districts of Sulaymaniyah province. We found six new localities for *N. microspilotus* in the Halabja and Pshdar districts of Sulaymaniyah province.

On 10 July 2007 an adult male *N. microspilotus* was found in a shallow mountain pond with a maximum depth of 7.3 cm. The pond (elevation 1307 m) branched from a running stream within a valley near Isawa village, Mawat Mountain, Sharbazher district (to the north of Sulaymaniyah City). Furthermore, additional new localities for *N. microspilotus* were discovered during extensive field surveys in northern Iraq (in Iraqi Kurdistan) performed during May and June 2012. At the Isawa site on 13 May 2012 we failed to locate any adult *N. microspilotus* but found hundreds of eggs and larvae in early metamorphosis stages. We also surveyed many suitable habitats in the Pshdar district on 15 May 2012 which resulted

Table 1. List of the New localities for *N. microspilotus* and *N. crocatus* in Northern Iraq (Kurdistan Region); M = male; F =female; L =larva; *= unknown count.

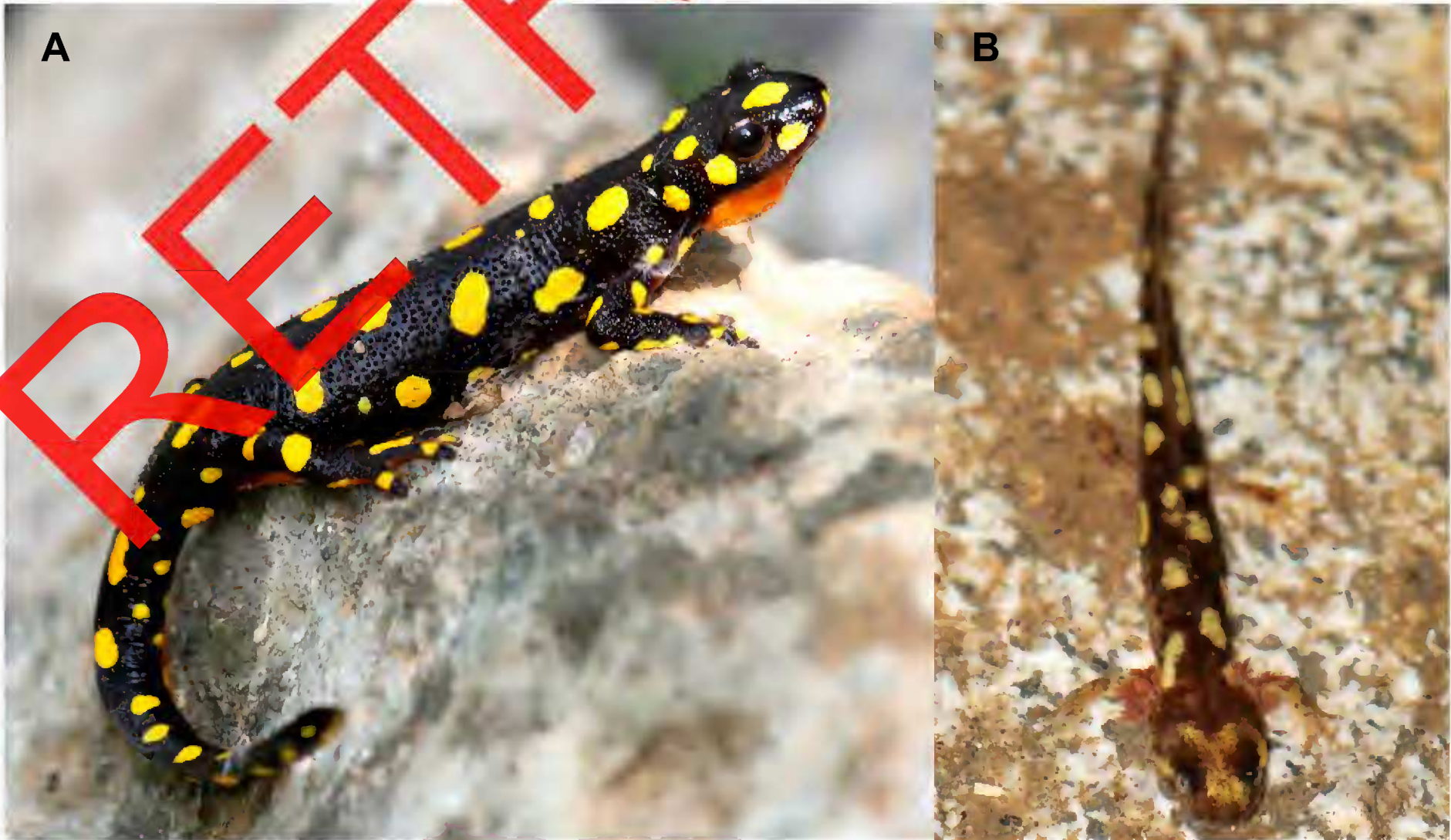
Province	District	Site	Coordinates	Neurergus species	M	F	L
Sulaymaniya	Sharbazher	Mawat - Isawa village	N 35°56' E 45°23'	<i>microspilotus</i>	1	-	*
Sulaymaniya	Halabja	Sargate	N 35°17' E 46° 6'	<i>microspilotus</i>	1	-	-
Sulaymaniya	Halabja	Ahmad Awa Area	N 35°18' E 46° 5'	<i>microspilotus</i>	1	-	31
Sulaymaniya	Halabja	Byara	N 35°13' E 46° 7'	<i>microspilotus</i>	7	4	208
Sulaymaniya	Pshdar	Qara and Abubakra Area	N 36°24' E 45° 3'	<i>microspilotus</i>	1	1	163
Sulaymaniya	Pshdar	Halsho	N 36°12' E 45°16'	<i>microspilotus</i>			23
Sulaymaniya	Pshdar	Hero	N 36° 7' E 45°17'	<i>microspilotus</i>	1	1	17
Total					12	6	42
Erbil	Shaqlawa	Doli Smaqli Area	N 36°21' E 44°19'	<i>crocatus</i>		-	-
Erbil	Choman	Grtk	N 36°46' E 44°52'	<i>crocatus</i>	1	1	-
Duhok	Duhok Area	Ashawaw - Sarsank	N 37°0' E 43°17'	<i>crocatus</i>	1		-
Duhok	Amedi	Sulav	N 37° 5' E 43°27'	<i>crocatus</i>	1	-	-
Total					4	2	-

in three new locations for *N. microspilotus*. Adult males and females were located in a small gravel pool branching from a running mountain stream at elevation ca.1309 m in the Hero area (to the southeast of the Qaladza township). Searches along the edge of the pool resulted in identifying 17 larvae in different metamorphosis stages. Both adults and larvae were carefully examined and photographed (Figs. 2a and b).

We located a breeding site for *N. microspilotus* at an elevation of ca.1342 m in a mountain pond to the north of Hero in the Halsho area to the northeast of Qaladza (ca. 10 km). A total of 23 larvae were found but no adults were found (Fig. 3a). On 9 June 2012 the Qara and

Abubakra areas were visited. After interviewing many locals we were able to locate adult males and females with 163 larvae in different metamorphic stages in a small mountain stream at an elevation of ca. 1300 m in the Qara mountain (Fig. 3b). In June 2012, our surveys for *Neurergus* were extended throughout suitable habitats in the Halabja district. In addition to the Schneider and Schneider (2011) sites, we located three new localities for *N. microspilotus* in Halabja.

An adult male along with 31 larvae were found in a mountain pond (elevation ca. 1400 m) in Ahmad Awa on 4 June 2012. Additionally, 11 individuals (seven males and four females) with 208 larvae in early metamorphic



Figs. 2a and 2b. *Neurergus microspilotus* (a): adult male; (b): larva, Hero of Pshdar district. Photographs by Omar Al-Sheikhly.

stages were found in Byara (ca. 12 km) to the southeast of Ahmad Awa and near the Schneider and Schneider (2011) sites in Tawale and Balkha (Fig.1). On the 5 June 2012, through interviews with local people, an adult male was located in a mountain stream at an elevation of ca.1254 m in Sargate area in Halabja (Table 1).

Lake Uremia newt (*Neurergus crocatus*)

Neurergus crocatus thrives in any suitable aquatic habitat found at an elevation of ca.1200–1500 m in the north-western parts of the Zagros Mountain Ecoregion in northern Iraq. In addition to the Schneider and Schneider (2011) *N. crocatus* localities, our 2012–2013 surveys resulted in four new localities for *N. crocatus* within the Erbil and Duhok provinces. Four males and two females were found (Table 1). However, it appears that there are many potential areas of suitable habitat for *N. crocatus* in northern Iraq still to be discovered. Four new localities (two in Erbil and two in Duhok) for *N. crocatus* were located during 2007 field surveys, and during a short visit to the Duhok area in 2013 (Fig.1).

In the Erbil Province two new localities were located. On 17 August 2007 an adult male and female were found in a mountain stream at elevation of ca. 1400 m in the Grtk Mountains in the Choman district of the Erbil Province (c. 15 km), close to the Iraq-Iran border (Fig. 4). On 25 August 2007 an adult male was found at elevation of ca. 1200 m in a mountain stream in Doli Smaqli area of Shaqlawa district in Erbil. On 1 September 2007 an adult male was located at the Sulav area in Amedi district at elevation of ca.1400–1500 m. On 15 April 2013 and during a short visit to the Ashawa Dam-Sarsank waterfall an adult male and female was found at an elevation of ca. 1206 m (Table 1).

Discussion

There is a paucity of information concerning *Neurergus* newts in Iraq. *Neurergus* newts have a restricted range and scattered distribution mainly confined to the habitat of the Zagros Mountain Forest Steep Ecoregion. Our 2007 to 2013 surveys suggest that *Neurergus* newts are



Figs. 3a and 3b. *Neurergus microspilotus* (a): juvenile at Halsho of Pshdar district; (b): Adult male (below) and female (above) in Qara mountain. Photographs by Omar Al-Sheikhly.



Fig. 4. Male (right) and female (left) *N. crocatus* in mountain stream at Grtk of Choman district in Erbil. Photograph by Omar Al-Sheikhly.

still thriving in suitable habitats in the northern mountains of Iraq, with locations concentrated mainly along the border with Iran. Our surveys extended the known range of *N. microspilotus* that included seven new locations in the mountains of northeastern Iraq. In addition, four new localities of *N. crocatus* were discovered in this region.

Our surveys show that there are two allopatric species of *Neurergus* newts in Iraq with the populations of *N. microspilotus* being restricted mainly to the eastern and northern mountains of Sulaymaniya Province with notable concentrations of populations in the Halabja and Pshdar districts. Halabja and Pshdar had six new locations of the *N. microspilotus* with high number of eggs and larvae. The Penjwin district also appears to provide many habitats for *N. microspilotus*. Schneider and Schneider (2011) reported *N. microspilotus* from three different localities in Penjwin, however, we believe that further surveys in Pshdar and Penjwin districts will reveal new localities for *N. microspilotus*. The protection of known localities in these three districts is urgently needed to conserve *N. microspilotus* in Iraq.

Populations of *N. crocatus* in Iraq are mainly restricted to the mountains and elevated grounds of Erbil and Duhok provinces, close to Iraq-Turkey border. Scattered populations of *N. crocatus* were located during our 2012–2013 surveys. However, many areas in the Erbil and Duhok provinces suspected to host *N. crocatus* have not yet been surveyed.

Conclusion

The mountain dwelling *Neurergus* newts are living in relictual aquatic environments which may make them particularly vulnerable to environmental changes. However the geographical range and distribution of *Neurergus* newts in Iraq are not yet fully accessed and little is known about their ecology and conservation biology. From our survey results and a literature search we consider that habitat destruction including pollution when combined with climate extremes, and especially droughts, are the main threats to these newts. Urban expansion and rapid development combined with severe drought especially

during the current years have impacted many fresh water springs, streams, ponds, and waterfalls which are considered the main habitats for *Neurergus* newts in northern Iraq. Solid wastes produced by tourism and agro-chemical pollutants, mainly from the use of agricultural pesticides and herbicides, are considered as the main pollutants that may impact *Neurergus* populations.

Therefore, serious conservation actions should be urgently undertaken in light of various factors negatively impacting populations of these unique salamanders. The Iraqi government is responsible for protecting mountain biota including *Neurergus* spp., and particularly the Critically Endangered *N. microspilotus*, as they are iconic species for conservation. Greater international cooperation between researchers and conservation agencies in Iraq, Iran, and Turkey, countries sharing similar mountainous habitats and water resources, should be strengthened in order to conserve the *Neurergus* species. The populations of *N. microspilotus* and *N. crocatus* and their unique habitat in the mountains of northern Iraq need to be urgently included in long-term monitoring programs with the aim of: 1) estimating the effective size and conservation significance of genetically distinct populations; 2) quantify the main threats and gathering additional information of the threats to salamander populations; 3) undertake in situ actions such as land/water management and protection; and 4) raising educational awareness should be prioritized to protect and conserve the genus *Neurergus* in Iraq.

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